

Amendments to the Claims

The listing of claims will replace all prior versions, and listings of claims in the application.

1. (currently amended) A method for generating a spectrally shaped digital dither signal in a digital signal processing circuit, comprising the steps of:

(1) generating a series of numbers having random characteristics and filtering said series of numbers thereby generating a digital data stream representing a spectrally shaped dither signal; and

(2) interpreting said digital data stream in two's complement format and adding said data stream to a series of signal values processed by the digital signal processing circuit, thereby reducing idle tone generation.

2. (canceled)

3. (currently amended) ~~The method of claim 1 wherein said filtering step uses A~~
method for generating a spectrally shaped digital dither signal in a digital signal processing circuit, comprising the steps of:

(1) generating a series of numbers having random characteristics and filtering said series of numbers using a filter with high-pass characteristics, thereby generating a digital data stream representing a spectrally shaped dither signal; and

(2) adding said data stream to a series of signal values processed by the digital signal processing circuit, thereby reducing idle tone generation.

4. *(original)* The method of claim 3 wherein said spectrally shaped dither signal represented by said data stream is attenuated at low frequencies with its energy concentrated in a band above 20 kHz.

5. *(original)* The method of claim 4 wherein said spectrally shaped dither signal represented by said data stream has its energy concentrated in a band above 40 kHz.

6. *(original)* The method of claim 3 wherein step (1) comprises processing said series of numbers having random characteristics in two's complement format.

7. ~~(currently amended) The method of claim 1 wherein step (2) is performed~~ A method for generating a spectrally shaped digital dither signal in a digital signal processing circuit, comprising the steps of:

_____ (1) _____ generating a series of numbers having random characteristics and filtering said series of numbers thereby generating a digital data stream representing a spectrally shaped dither signal; and

_____ (2) _____ selectively adding said data stream to a series of signal values processed by the digital signal processing circuit when said series of signal values represents a signal amplitude below a predetermined threshold, thereby reducing idle tone generation.

8. (*original*) The method of claim 1 wherein step (1) comprises using a pseudo-random number generator to generate said series of numbers having random characteristics.

9. (*original*) The method of claim 8 wherein said pseudo-random number generator comprises a linear feedback shift register.

10. (*original*) The method of claim 1 wherein said digital signal processing circuit is a digital modulator circuit.

11. (*original*) The method of claim 10 wherein said digital modulator circuit is part of a cable television receiver.

12. (currently amended) An apparatus for generating a spectrally shaped digital dither signal in a digital signal processing circuit, comprising:

number generating means for generating a series of numbers having random characteristics;

filter means connected to said number generating means for processing said series of numbers through a digital filter to produce a digital data stream in two's complement format representing a spectrally shaped signal; and

dithering means connected to said filter means for receiving said digital data stream and adding said data stream in two's complement format to a series of signal values processed by the digital signal processing circuit, thereby reducing idle tone generation.

13. (canceled)

14. (currently amended) ~~The apparatus of claim 12 wherein said digital filter has~~
An apparatus for generating a spectrally shaped digital dither signal in a digital signal
processing circuit, comprising:

number generating means for generating a series of numbers having
random characteristics;

filter means connected to said number generating means for processing
said series of numbers through a digital filter with high-pass filter characteristics to
produce a digital data stream representing a spectrally shaped signal; and

dithering means connected to said filter means for receiving said digital
data stream and adding said data stream to a series of signal values processed by the
digital signal processing circuit, thereby reducing idle tone generation.

15. (original) The apparatus of claim 14 wherein said filter means produces a spectrally shaped signal represented by said data stream that is attenuated at low frequencies with its energy concentrated in a band above 20 kHz.

16. (original) The apparatus of claim 15 wherein said spectrally shaped signal represented by said data stream has its energy concentrated in a band above 40 kHz.

17. (original) The apparatus of claim 14 wherein said series of numbers having random characteristics are processed in two's complement format.

18. (currently amended) ~~The apparatus of claim 12 further comprising~~ An apparatus for generating a spectrally shaped digital dither signal in a digital signal processing circuit, comprising:

number generating means for generating a series of numbers having random characteristics;

filter means connected to said number generating means for processing said series of numbers through a digital filter to produce a digital data stream representing a spectrally shaped signal;

dithering means connected to said filter means for receiving said digital data stream and adding said data stream to a series of signal values processed by the digital signal processing circuit, thereby reducing idle tone generation; and

dithering control means for selectively adding said data stream to said signal values only when said series of signal values represents a signal amplitude below a predetermined threshold.

19. (*original*) The apparatus of claim 12 wherein said number generating means comprises a pseudo-random number generator.

20. (*original*) The apparatus of claim 19 wherein said pseudo-random number generator operates using a linear feedback shift register.

21. (*original*) The apparatus of claim 12 wherein said digital signal processing circuit is a digital modulator circuit.

22. (*original*) The apparatus of claim 21 wherein said digital modulator circuit is part of a cable television receiver.

23. (currently amended) An apparatus for generating a spectrally shaped dither signal in a digital signal processing circuit that processes a series of signal values, comprising:

a number generating circuit that generates a series of numbers having random characteristics representing a signal;

a digital filter connected to said number generating circuit, said digital filter receiving said signal and producing a digital data stream in two's complement format representing a spectrally shaped signal; and

a summing circuit connected in a path of ~~said~~ the series of signal values processed by the digital processing circuit and connected to said digital filter to receive said digital data stream in two's complement format and add said digital data stream to ~~said~~ the series of signal values as a dither signal, thereby reducing idle tone generation.

24. (canceled)

25. (currently amended) ~~The apparatus of claim 23 wherein said digital filter has~~
An apparatus for generating a spectrally shaped dither signal in a digital signal processing circuit that processes a series of signal values, comprising:

a number generating circuit that generates a series of numbers having random characteristics representing a signal;

a digital filter having high-pass filter characteristics connected to said number generating circuit, said digital filter receiving said signal and producing a digital data stream representing a spectrally shaped signal; and

a summing circuit connected in a path of the series of signal values processed by the digital processing circuit and connected to said digital filter to receive said digital data stream and add said digital data stream to the series of signal values as a dither signal, thereby reducing idle tone generation.

26. *(original)* The apparatus of claim 25 wherein said digital filter produces a spectrally shaped signal represented by said data stream that is attenuated at low frequencies with its energy concentrated in a band above 20 kHz.

27. *(original)* The apparatus of claim 26 wherein said spectrally shaped signal represented by said data stream has its energy concentrated in a band above 40 kHz.

28. *(original)* The apparatus of claim 25 wherein said series of numbers having random characteristics are processed in two's complement format.

29. *(currently amended)* ~~The apparatus of claim 23 further comprising a~~ An apparatus for generating a spectrally shaped dither signal in a digital signal processing circuit that processes a series of signal values, comprising:

a number generating circuit that generates a series of numbers having random characteristics representing a signal;

a digital filter connected to said number generating circuit, said digital filter receiving said signal and producing a digital data stream representing a spectrally shaped signal;

a summing circuit connected in a path of the series of signal values processed by the digital processing circuit and connected to said digital filter to receive said digital data stream and add said digital data stream to the series of signal values as a dither signal, thereby reducing idle tone generation; and

a control circuit connected to said summing circuit that selectively actuates said summing circuit to add said data stream to said signal values only when said series of signal values represents a signal amplitude below a predetermined threshold.

30. *(original)* The apparatus of claim 23 wherein said number generating circuit comprises a pseudo-random number generator.

31. *(original)* The apparatus of claim 30 wherein said pseudo-random number generator operates using a linear feedback shift register.

32. *(original)* The apparatus of claim 23 wherein said digital signal processing circuit is a digital modulator circuit.

33. *(original)* The apparatus of claim 32 wherein said digital modulator circuit is part of a cable television receiver.

34. (*original*) An improved digital modulator, comprising:

a modulation circuit having a digital input that receives a series of values representing amplitudes of an input audio signal at a first level of precision and a digital signal processing circuit that quantizes the received values as a digital audio signal at a second level of precision lower than said first level of precision and generates an output representing said digital audio signal at said second level of precision;

a number generating circuit that generates a series of numbers having random characteristics representing a signal;

a digital filter with high pass characteristics connected to said number generating circuit to receive said signal and generate from said signal a digital dither data stream representing a spectrally shaped dither signal; and

a summing circuit connected to said digital signal processing circuit and to said digital filter to receive said digital dither data stream and provide said digital dither data stream to said digital signal processing circuit as a dither signal, thereby reducing idle tone generation when said input audio signal has low amplitude.